

# DISTRIBUTION AND ABUNDANCE OF JUVENILE COHO AND STEELHEAD IN WADDELL CREEK IN 1993.

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## INTRODUCTION

Wild runs of native coho (Oncorhynchus kisutch) are found in only two streams south of San Francisco, Waddell and Scott creeks. All female southern coho are three year olds, so coho populations consist of three independent year classes (Shapovalov and Taft 1954). On Waddell Creek no coho smolts were trapped during the last half of the downmigration period in 1992, indicating that the 1991 year class was very weak or extirpated (Smith 1992a). In February 1992 a heavy flood damaged many coho redds, and the 1992 year class of coho was very rare compared to steelhead (Smith 1992b); only 19 juvenile coho were collected in summer electroshock sampling of about 9 percent of potential coho rearing habitat. The 1992 coho year class may have amounted to only several hundred fish, and only 119 coho were caught in downmigrant trapping during the last half of the 1993 downmigration period (Smith 1993). Therefore, the 1992 year class was extremely weak, and that year class is also endanger of extirpation. Adult trapping of coho in winter 1992-3 was largely prevented by sustained high flows during the coho migration period (Smith 1993). Only one adult salmon was captured in 1992-3, although the relatively large number of 2 year old males captured in 1991-2 (Smith 1992a) suggested that 1992-3 should have had a significant adult run. Here we report the results of summer/fall electroshock sampling on Waddell Creek, which provide the only data presently available on the 1993 coho year class.

## METHODS

The electroshock sampling of Waddell Creek in 1993 was carried out as part of a study of steelhead (O. mykiss) ecology by Lanette Davis. Twelve of the 13 sites sampled in the 1992 coho study (Table 1) were resampled in 1993; the Camp Herbert site was not resampled, but a new site 0.6 miles up the East Fork was added (Tables 2 and 3). Eight sites were sampled in July and August, and 13 sites, including 7 sampled in July and August, were sampled in October or December (Tables 2 and 3).

Because only a secondary goal of the 1993 study was to determine

coho distribution and abundance, sampling was not as intensive as in 1992. One-third less total stream length was sampled, and at 4 of the sites, less than 100 feet of stream was sampled. In 1992 sampling was strongly biased towards the pool and glide habitats preferred by coho (Table 1). In 1993 the sampling of individual habitat types was more nearly representative of available habitats (Tables 2 and 3), including shallow run and riffle habitats unlikely to be utilized by coho.

At most sites several individual pool, glide, run and riffle habitats were sampled. Individual habitats were block-netted and sampled by 2 or 3 passes with a backpack electroshocker (Smith Root Type VII, smooth pulse). Captured fish were held in a floating live car and measured in 5 mm increments. Steelhead were assigned to age classes, based upon length-frequency distribution at the site. At sites sampled in July and August, fish were individually marked by injected dye or paint to determine fish fidelity to the site and to individual microhabitats.

In June and December the lagoon was seined to determine whether coho had used the lagoon for rearing in 1993.

## RESULTS

In July and August 1993, 44 coho were collected (Table 2), and in October and December, 58 coho were collected (Table 3). In the October/December samples mean coho density at the sites was estimated at 3.6 fish per 100 feet of stream, or approximately 6.7% of the density of young-of-the-year steelhead (Table 3) and less than 1/2 the density of age 1+ and older steelhead.

As in 1992, no coho were found at the single site sampled upstream of Slippery Falls on the West Fork (Table 3). In the lower 1.8 miles of the stream, only 2 coho were collected, and none were collected in the lagoon (Tables 2 and 3). However, coho were collected at 8 of the 9 sites between mile 2 and falls on the East and West forks (Table 3). At the only site (#10) where coho were not collected, only 89 feet of stream, consisting mostly of shallow run and riffle habitat, was sampled. Coho were even collected in Henry Creek, a small tributary downstream of Slippery Falls, and in a rather steep and bouldery channel (B1 channel type) on the East Fork (Table 3).

Steelhead abundance was generally similar, both in stream total and at sites, between 1992 and 1993 (Tables 1-3). Young-of-year steelhead made up approximately 85 percent of total steelhead abundance in 1993 and 82 percent in 1992 (Tables 1 and 3).

## DISCUSSION

### Coho Abundance

The number of coho collected in October and December 1993 was more than three times (58 versus 19) that collected in July and August of 1992, despite sampling one-third less stream length (Tables 1 and 3). In addition, the more representative sampling of runs and riffles in 1993 makes the observed densities more representative of actual coho abundance. If the October/December density of 3.6 coho per 100 feet of stream were applied to the approximately 6 miles of potential coho habitat in the watershed, the total 1993 coho population would be estimated at 1140 fish. Since deeper, larger pools, most preferred by coho, were not sampled, the population is likely to be somewhat higher.

Although the 1993 production of coho was apparently considerably higher than the several hundred estimated for 1992, the numbers are still low. If 3 percent of the 1993 coho are able to return as adults, that would only produce a spawning population of approximately 34 fish. An adult run of that size could barely seed the available rearing habitat in a good winter (approximately one pair per 1/3 mile). In a winter of poor access or of extensive redd destruction by major floods, low spawning success from such a small population could jeopardize the one remaining sustaining year class.

### Habitat Conditions

The lower 2.3 miles of Waddell Creek are flat and dominated by sand and fine gravel substrate. From there upstream to the forks, cobbles become progressively more abundant, but large (>1") gravel is rare. Good, "flood-proof" spawning sites are rare downstream of the forks. Successful coho spawning in many years is probably limited to the east and west forks of the creek. In early January 1993, 19 of 23 redds (including steelhead) were on the West Fork, between miles 3.3 and 4.9. In 1992, a severe mid-February flood destroyed 5 known coho redds downstream of the forks, and coho rearing was primarily in, and immediately downstream of, the lower West Fork. Coho utilization of the suitable rearing habitat downstream of the forks is probably limited in many years by lack of successful spawning in the lower watershed and by lack of high enough densities upstream to force downstream dispersal. Juvenile steelhead are abundant in the lower portion of the creek; this probably reflects successful spawning by late-run (post-flood) fish.

No coho have ever been collected during the summer/fall rearing period in the lagoon. It is still not known whether their absence from the lagoon reflects warm early summer lagoon temperatures (>22 degrees C) or whether it merely reflects general coho rarity in the lower portion of the creek.

The East Fork of Waddell Creek is steeper than the West Fork, and provides abundant run and riffle habitat more suitable for

steelhead than coho. In addition, because of its steepness and larger watershed, the East Fork is probably more prone to redd destruction by major floods. In 1992 no coho were found at the single site sampled on the East Fork. In milder winters, coho may spawn as far as 0.8 miles upstream, and rear in the relatively few deep, bouldery pools.

Coho apparently do not ascend Slippery Falls on the West Fork, but the steep, rocky habitat upstream of the falls is more suited to steelhead than to coho. However, coho apparently do utilize Henry Creek for both spawning and rearing in non-flood years. This small tributary is important for coho, because it provides almost the only spawning habitat for about 1/2 mile downstream of Slippery Falls.

#### ACKNOWLEDGMENTS

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Table 1. Site locations, habitat types present and sampled, and number of steelhead and coho collected and density ( ) per 100' at sites on Waddell Creek in July and August 1992.

Site	Mile >Hwy1	Chan Type	%Hab PL	Avail GL	%Hab RN	Sampl RF	%Hab PL	Sampl GL	Sample RN	Sample Length	#SHT 0+	#Coho 1+	
1 >Div	0.6	C3	33	45	15	7	53	47	0	220'	110 (50)	21 10	- 0)
2 <Alder Camp	1.35	C3	30	50	10	10	94	6	0	269	84 (31)	17 6	- 0)
3 Twin Redwoods	1.8	C3	25	50	15	10	43	57	0	327	133 (41)	49 15	- 0)
4 Peri- winkle	2.2	C3	35	50	10	5	64	36	0	221	129 (58)	24 11	- 0)
5 Pullout <Herbert	2.6	C1	20	45	25	10	54	45	1	262	80 (31)	31 12	1 0)
6 Camp Herbert	3.1	C1	30	35	25	10	49	47	4	366	145 (40)	31 8	8 2)
7 E Fork > Ford	3.2	C1	25	40	20	15	86	14	0	245	50 (20)	9 4	- 0)
8 W Fork	3.3	C3	30	40	20	10	81	19	0	199	30 (15)	7 4	7 4)
9 Mill Site	3.9	C3	45	30	15	10	82	18	0	246	69 (28)	14 6	1 0)
10 Trib @ Bridge	4.7	C1 C1-1	15	40	30	15	47	53	0	251	94 (37)	19 8	2 1)
11 HenryCr Trail	5.25	B1-1	30	25	25	20	93	7	0	101	126 (125)	15 15	1 1)
Slippery Falls	5.35												
12 Upper Bridge	5.45	B1-1	20	35	25	20	81	0	19	97	123 (126)	24 25	- 0)
13 HenryCr >Trail	0.2	F	20	35	25	20	48	52	0	54	67 (124)	4 7	- 0)
Totals			31	38	19	12	67	31	2	2858'	1240 1505	265	19

Table 2. Site locations, habitat types present and sampled, and number of steelhead and coho collected and density ( ) per 100' at sites on Waddell Creek in July and August 1993.

Site	Mile >Hwy1	Chan Type	%Hab Avail				%Hab Sampl				Sample Length	#SHT		#Coho
			PL	GL	RN	RF	PL	GL	RN	RF		0+	1+	
1 >Div	0.6	C3	30	40	20	10	32	32	36	0	102'	61 (60	8 8	1 1)
2 <Alder Camp	1.35	C3	30	45	15	10	30	29	41	0	292	107 (37	10 3	- 0)
5 Pullout <Herbert	2.6	C1	40	40	12	8	23	17	22	38	148	95 (64	3 2	2 2)
7 E Fork > Ford	3.2	C1	25	40	20	15	39	5	56	0	280	95 (34	31 11	11 4)
8 W Fork	3.3	C3	30	45	20	5	43	33	6	18	254	90 (35	9 4	18 7)
9 Mill Site	3.9	C3	45	40	10	10	35	25	29	11	197	132 (67	9 5	5 3)
11 HenryCr Trail	5.25	B1-1	25	35	30	15	40	36	0	24	130	68 (52	8 6	2 2)
Slippery Falls	5.35													
13 HenryCr >Trail	0.2	F	65	10	10	15	0	99	0	0	37	19 (51	9 24	5 14)
Totals			36	36	17	11	30	25	24	11	1186'	667 754	87	44
Population Estimates:												809	92	56
Density per 100'												68	8	5

Table 3. Site locations, habitat types present and sampled, and number of steelhead and coho collected and density ( ) per 100' at sites on Waddell Creek in October and December(\*) 1993.

Site	Mile >Hwy1	Chan Type	%Hab Avail				%Hab Sampl				Sample Length	#SHT		#Coho
			PL	GL	RN	RF	PL	GL	RN	RF		0+	1+	
A Lagoon*	0.0	C4									160'	131		0
2 <Alder Camp	1.35	C3	30	45	15	10	30	29	41	0	292	75 (26	11 4	1 0)
3 Twin Redwoods	1.8	C3	40	10	40	10	40	0	29	31	90	26 (29	4 4	- 0)
4 Peri- winkle	2.2	C3	45	10	20	25	32	0	42	26	140	174 (124	7 5	5 4)
5 Fullout <Herbert	2.6	C1	40	40	12	8	23	17	22	38	148	106 (72	5 3	6 4)
7 E Fork > Ford	3.2	C1	25	40	20	15	33	6	61	0	255	61 (24	9 4	5 2)
14 E Fork Last Chance Cr.*	3.7	B1	35	10	35	20	50	7	44	0	224	95 (42	47 21	9 4)
8 W Fork	3.3	C3	30	45	20	5	43	33	6	18	254	100 (39	6 2	17 7)
9 Mill Site	3.9	C3	40	40	10	10	35	25	29	11	197	73 (37	8 4	8 4)
10 Trib @ Bridge	4.7	C1 C1-1	40	25	15	20	19	0	53	28	89	59 (66	2 2	- 0)
11 HenryCr Trail	5.25	B1-1	30	25	25	20	40	36	0	24	130	49 (38	9 7	2 2)
Slippery Falls 5.35														
12 Upper Bridge	5.45	B1-1	65	10	10	15	99	0	0	0	36	33 (91	28 78	- 0)
13 HenryCr >Trail	0.2	F	25	35	30	15	0	99	0	0	32	17 (53	9 28	5 16)
Totals (Stream only)			37	27	22	14	38	21	28	14	1857'	808 953	145	58
Population Estimates:												1000	147	66
Density (per 100')												54	8	3.6